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Aerosol deposition of AuNP into biological fluids produce specific biomolecule corona

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Due to the special properties of nanoparticles, concern has been raised with regards to their potential effects in biological systems. When biomolecules bind to the particle surface a dynamic protein/biomolecule corona form (Cedervall, 2007). This particle/biomolecule complex is believed to be what the cells actually perceive and in addition to particle properties may be a major determinant of particle toxicity (Lynch, 2009). We present a method to investigate the composition of the biomolecule/protein corona on model nanoparticles in different physiological fluids, porcine serum and lung fluid. Gold nanoparticle (AuNP) agglomerates were generated as aerosols by high temperature evaporation-condensation furnace. The agglomerates where sintered to spherical shape and characterized with regards to mobility size, mass and with transmission electron microscopy. The sintered AuNPs (median 60 nm) were deposited into solutions of bovine serum albumin (BSA) and homocysteine using an electrostatic precipitator. The AuNPs was in addition to mass-mobility characterized, in gas phase, analyzed with dynamic light scattering in suspension. AuNPs in solution were mixed with porcine serum or porcine lung fluid. Using gel electrophoresis (SDS-PAGE) the protein corona was determined for AuNPs mixed with the physiological fluids. SDS-PAGE results indicate that the corona is similar regardless of surfactant, BSA or homocysteine. Also the corona is different between particles mixed with lung fluid or blood-serum.

In conclusion: We have shown that the protein / biomolecule corona can be studied using model particles generated in the aerosol phase and stabilized with BSA and homocysteine in suspension, and that deposition directly into serum and lung fluid is also possible. However, the observed corona differ between particles administered to porcine blood serum and lung fluid. This work was supported by the Nanometer

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Cedervall, T et al. (2007). PNAS, 104, 7, 2050-2055.

Lynch, I et al. (2009). Nat Nanotechnol, 4, 577-80.